Section II (Remarks)

Amendment of the Claims: Cancellation of Non-Elected Claims; Addition of New Claims

In the April 8, 2008 Office Action, claims 20-33 were withdrawn from further consideration pursuant to restriction requirement. In addition, claims 3, 4, 12 and 18 were withdrawn in such Office Action as being drawn to a nonelected species.

In this response, all such withdrawn claims 3, 4, 12, 18 and 20-33 have been canceled. Such cancellation of withdrawn claims is with express reservation of the right to file divisional application(s) directed to the subject matter of such canceled claims, during the pendency of the present application or a further divisional or continuation application based on and claiming the priority of the present application.

Claims 1, 2, 5-11, 13-17 and 19 have been amended to specify the invention and further differentiate over the art.

Claim 1 has been amended to recite a thermal management system for cooling of a high-capacity battery, as shown in[1] and described with reference to FIG. 6.

Amended claim 1 specifies the thermal management system for cooling of a high-capacity battery including a top face having terminals thereon, with the thermal management system comprising "a plate member overlying and parallelly aligned with said top face to form a gap therebetween, with a gap opening along side edges of the plate member communicating with an ambient environment of the thermal management system, said plate member including at least one opening therein, wherein each plate member opening has disposed therein a downdraft fan, constructed and arranged to direct cooling gas from said ambient environment directly on the top face of the high-capacity battery… and to discharge the cooling gas, after contact with the top face of the battery, through said gap opening along side edges of the plate member."

[1] See MPEP 608 (Disclosure), noting that "Applicant may rely for disclosure upon the specification with original claims and drawings, as filed.

The terminal and strap cover previously alternatively recited in claim 1 has been deleted from such claim, and claim 2 has been amended to incorporate the recital deleted from claim 1.

Claim 5 has been amended to recite the thermal management system as further comprising thermal monitoring circuitry arranged to monitor battery temperature and to actuate the downdraft fan(s) when battery temperature rises above a predetermined set point value, consistent with the disclosure at page 14, in paragraph [0061] of the present application.

Claim 6 has been amended to recite such thermal monitoring circuitry as comprising a monitoring device selected from a the group consisting of thermocouples, thermistors, and thermostats, consistent with the disclosure at page 14, paragraph [0061] and page 18, paragraph [0081] of the present application.

Claim 7 has been amended to recite the thermal monitoring circuitry as comprising switches for activating the downdraft fan(s), as described in paragraph [0081] at page 18 of the present application.

Claim 8 has been amended to recite the thermal management system as further comprising load-sensing circuitry arranged to monitor battery load and to actuate the downdraft fan(s) when the battery is being discharged in use, and claim 9 as amended recites the thermal management system as further comprising current-draw monitoring circuitry arranged to monitor battery current draw and to actuate the downdraft fan(s) when the battery is being discharged in use. Such claims are consistent with and supported by the disclosure at page 18, paragraph [0081] of the present application.

Claim 10 has been amended to recite each opening in the plate member of the thermal management system as having a cylindrical collar disposed in the opening and the downdraft fan as being in the interiorly mounted in the cylindrical collar. Such arrangement is described, for example, in paragraph [0076] on page 17 of the present application, and shown in FIG. 6 of the application.

Claim 11 as amended herein depends from claim 10, and recites the thermal management system as further comprising a protective grate member mounted at the top open-end of the cylindrical collar and overlying the downdraft fan mounted therein, as described in paragraph [0076] at page 17 of the application.

Claim 13 has been amended to recite the plate member overlying the high-capacity battery as being hinged at one end thereof, as shown in FIG. 3 and described in paragraph [0066] at page 15 of the application.

Claim 14 and recites multiple downdraft fans mounted at corresponding openings in the plate member, as described, for example, in paragraph [0067] at page 15 of the present application.

Claim 15 recites a vehicle adapted to be powered by a high-capacity battery including a top face having terminals thereon, with such vehicle comprising a thermal management system recited in terms consistent with those of amended claim 1, discussed above.

Claim 16 depends from claim 15, and recites that the battery comprises an array of high-capacity batteries wherein successive high-capacity batteries are arranged in abutting relationship to one another, consistent with the description at paragraph [0071] on page 16 of the present application, and as shown in FIG. 6 therein.

Claim 19 recites a vehicle of claim 15 as comprising a forklift vehicle, consistent with the description in paragraph [0034] at page 8 of the present application ("a forklift battery-powered truck or other powered installation or vehicle").

New claims 34-44 have been added herein to specify particular features and aspects of the invention. Such claims 34-44 depend either directly or indirectly from claim 2, which depends in turn from claim 1, and these added claims correspond in substance to now-cancelled claims 21-31.

No new matter within the meaning of 35 U.S.C. §132(a) has been introduced by the foregoing amendments.

US Patent 6,549,014 as Intended Reference Cited in IDS Filed January 26, 2006

In the April 8, 2008 Office Action, the examiner noted a typographical error in the citation of US Patent 6,459,014 in the Information Disclosure Statement filed January 26, 2006. Applicants confirm that the reference should have been cited as US Patent 6,549,014, issued April 15, 2003 to Nasser H. Kutkut et al. for "Battery Monitoring Method and Apparatus."

Applicants note the examiner's statement,

> "If applicant advises the examiner of the correct patent No., the examiner will reconsider the January 26, 2006 IDS and make the appropriate corrections thereto on applicants behalf,"

with appreciation for the examiner's proposed action.[2]

Rejections of Claims 1, 2, 5-10, 13-16 and 19 Under 35 USC 112, Second Paragraph

In the April 8, 2008 Office Action, claims 1, 2, 5-10, 13-16 and 19 were rejected under 35 USC 112, second paragraph as indefinite for recital of the term "fast charging" in claim 1.

Specifically, the Office Action stated that:

> "The term 'fast charging' in claim 1 is a relative term which renders the claim and definite. The term 'fast' is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention." (Office Action, page 3)

This rejection is traversed, on the basis that the application in fact provides an express definition of the term at issue, in paragraph [0002] on page 2 of the application:

[2] a Supplemental Information Disclosure Statement form PTO/SB/08A for US Patent 6,549,014 is enclosed, to complete the record in this respect.

> "'Fast charging' refers herein to charging a battery at a rate of greater than 30 amperes per 100 ampere-hours of battery capacity." (Present application, page 2, paragraph [0002])

Accordingly, this terminology is fully clear and definite, and comports with the requirements of 35 USC 112, second paragraph.

The rejection of claims 1, 2, 5-10, 13-16 and 19 therefore is requested to be withdrawn.

Rejections of Claims on Reference Grounds in the April 8, 2008 Office Action, and Traversal Therof

In the April 8, 2008 Office Action, claims 1, 2, 5-10, 13-16 and 19 were rejected on reference grounds, including

- a rejection of claims 1, 2, 5-10, 13, 16 and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Hamada et al. (U.S. Patent 5,800,942); and
- a rejection of claim 14 under 35 USC 103(a) as being unpatentable over Hamada, et al.

These rejections are traversed in application to the claims as amended/added herein, and reconsideration is requested of the patentability of claims 1, 2, 5-10, 13-16, 19 and 34-44, on the basis of the following remarks.

Patentable Distinction of Claims 1, 2, 5-10, 13-16, 19 and 34-44 Over the Cited References

Claim 1, from which all other pending claims 2, 5-10, 13-16, 19 and 34-44 directly or indirectly depend, recites:

> 1. A thermal management system for cooling of a high-capacity battery including a top face having terminals thereon, said thermal management system comprising a plate member overlying and parallelly aligned with said top face to form a gap therebetween, with a gap opening along side edges of the plate member communicating with an ambient environment of the thermal management system, said plate member including at least one opening therein, wherein each plate member opening has disposed therein a downdraft fan, constructed and arranged

> to direct cooling gas from said ambient environment directly on the top face of the high-capacity battery during at least one of (a) fast charging of the battery, and (b) use of the battery generating heat, and to discharge the cooling gas, after contact with the top face of the battery, through said gap opening along side edges of the plate member.

Such a thermal management system is markedly different from, and achieves a substantial advance over, the Hamada cooling system. Set out below is the schematic representation of FIG. 6 of the present application,

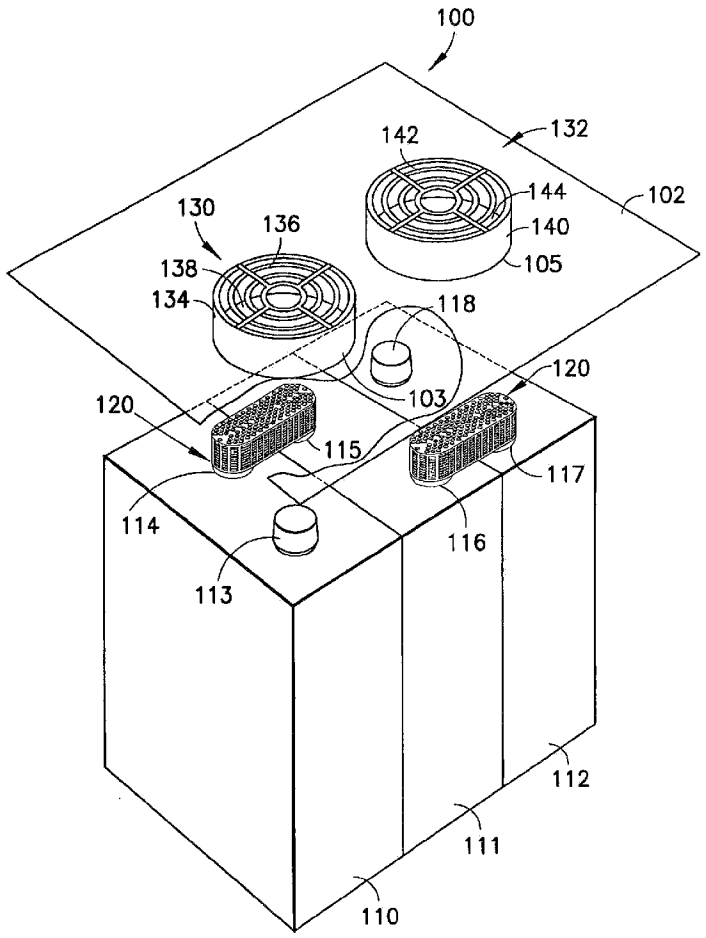


FIG. 6 of Hamada

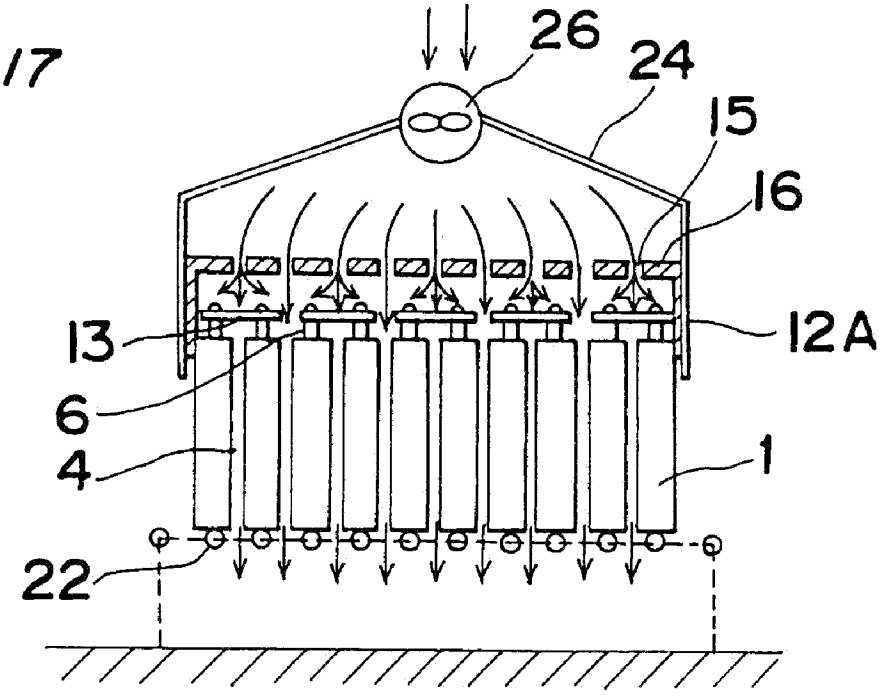
showing the plate member arranged parallelly to the top face of the battery so that the downdraft fans 138 and 144 impinge cooling gas directly onto the top face of the battery and so that the gas contacted with the top face of the battery then is immediately laterally directed in the gap between the plate and the top face of the battery so that it issues out at the open edges of this gap

and passes into the ambient environment. As a result of this arrangement, with direct impingement of gas from the fans onto the top face of the battery bearing the terminal structures, and immediate flushing of the gap by the cooling gas, there is an extremely high (maximal) heat transfer gradient providing corresponding high-efficiency cooling of the top face and associated terminals of the battery.

By contrast, the structure employed by Hamada cannot achieve the maximal heat transfer gradient and hydrodynamic cooling efficiency of the applicants' claims invention.

The cited FIG. 17 of Hamada is reproduced below for ease of ensuing discussion.

Fig. 17



It is noted that in Hamada, there is no "plate member overlying and parallelly aligned with said top face [of the battery] to form a gap therebetween, with a gap opening along side edges of the plate member communicating with an ambient environment of the thermal management system," as required by the applicants' claimed invention. Hamada positions a blower 26 at the crest of a pitched roof structure. This structure does not provide an open side gap between the plate and top face of the battery for lateral discharge of the cooling gas into the ambient environment.

Contrariwise, Hamada features an array of elongate electrochemical cells that are separated from each other, so that gas is flowed vertically downwardly over the full length of the cells, exiting at the bottom of such cells, as indicated by the corresponding arrows in the above-reproduced FIG. 17.

Further, in contrast to applicants' claimed structure, arranged "to direct cooling gas from said ambient environment directly on the top face of the high-capacity battery," Hamada interposes an insulating cover 16 between the pitched roof structure and the upper portions of the electrochemical cells positioned in laterally spaced-apart relationship to one another, so that the gas expands in the pitched roof structure, over its diverging (in a downward direction) cross-section, and then passes through vent perforations in the insulating cover, and thereafter finally contacts the upper portions of the electrochemical cells, following which the cooling gas flows downwardly along the sides of the cells and is discharged at the lower ends of the vertically extended cells.

As a result, the cooling gas in Hamada has a much longer residence time in flowing vertically downwardly through the pitched roof structure, the vent perforations in the insulating cover, and downwardly along the full vertical length of the electrochemical cells, than does the cooling gas in applicants' claimed invention that is down-flowed by the fan(s) in the plate member, directly onto the top face of the battery, and then flushed from such battery top face through the open gap between the plate and the battery top face, into the ambient environment.

Thus, the cooling gas in applicants' claimed thermal management system will have an extremely short residence time and an extremely high temperature gradient to produce very high rate heat removal from the battery. Further, the "open" flow path provided by the gap between the plate member and battery top face provides minimum impediment to the cooling gas flow, in contrast to the slotted vent insulating cover employed by Hamada to distribute the gas flow, which introduces a substantial flow barrier to the cooling gas.

In consequence of these structural differences, the applicants' claimed thermal management system provides vastly greater cooling efficiency that is achievable by Hamada. It is evident that the thermal management system of amended claim 1 is fundamentally structurally dissimilar to

that of Hamada. Further, there is no teaching or other suggestive basis in Hamada from which the applicants' claimed thermal management system can be derived.

For such reasons, amended claim 1 is patentably differentiated from the disclosure of Hamada, and therefore claim 1, as well as claims 2, 5-10, 13-16 and 19 and added claims 34-44, all of which either depend (directly or indirectly; see claims 2, 5-10, 13-14, 16, 19, and 34-44) or else (see claim 15) incorporate the limitations of claim 1, are patentable over Hamada, considered either from a §102 or§103 perspective.

It therefore is requested that the rejection of claims 1, 2, 5-10, 13-16 and 19 be withdrawn, and that amended claims 1, 2, 5-10, 13-16 and 19, as well as added claims 34-44, be allowed.

Petition under 37 CFR 1.136 for Extension of Time

Petition hereby is made under the provisions of 37 CFR 1.136 for a one-month extension of the term for reply to the April 8, 2008 Office Action, extending the deadline for such reply from July 8, 2008 to August 8, 2008.

The amount of $60 specified in 37 CFR 1.17 (a)(1) is being paid by online credit card payment at the time of EFS submission of this response.

Authorization also is hereby given to charge the amount of any deficiency in fees due and payable, to Deposit Account No. 08-3284 of Intellectual Property/Technology Law.

Added Claims Fee

With the cancellation of claims 3, 4, 12, 18 and 20-33 herein, the concurrent introduction of new claims 34-44 entails no net addition of total claims or independent claims, beyond the respective numbers of total and independent claims for which payment previously was made. Accordingly, no added claims fee is determined to be necessary.

Nonetheless, as noted above, any deficiency in fees due and payable for this response is hereby authorized be charged to Deposit Account No. 08-3284 of Intellectual Property/Technology Law.

CONCLUSION

Claims 1, 2, 5-10, 13-16, 19 and 34-44, as amended/added herein, have been shown to be fully patently distinguished over the cited art, and now are in form and condition for allowance.

Issue of a Notice of Allowance for such claims therefore is requested. If any issues require further resolution, the examiner is requested to contact the undersigned attorney at (919) 419-9350 to discuss their resolution, in order that the present application may be passed to issue, at an early date.

Respectfully submitted,

/steven j. hultquist/

Steven J. Hultquist
Reg. No. 28,021
Attorney for Applicants

INTELLECTUAL PROPERTY/
TECHNOLOGY LAW
Phone: (919) 419-9350
Fax: (919) 419-9354
Attorney File No.: 4213-104

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